

Interactive comment on “Organosulfates in atmospheric aerosol: synthesis and quantitative analysis of PM_{2.5} from Xi’an, Northwest China” by Ru-Jin Huang et al.

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The authors thank the referee to review our manuscript and particularly for the valuable comments and suggestions that have significantly improved the manuscript. We have made most of the changes suggested by the referees and have outlined these in detail below.

Anonymous Referee #2

This manuscript reports the synthesis for nine organosulfates, including phenyl sulfate, 3-methylphenyl sulfate, benzyl sulfate, 2-methyl benzyl sulfate, 3-methyl benzyl

C1

sulfate, 2,4-dimethyl benzyl sulfate, 3,5-dimethyl benzyl sulfate, hydroxyacetone sulfate, and glycolic acid sulfate. Four standards were then used to optimize a UPLC-ESI/MS method for identification and quantification of organosulfates. The novelty of this study lies in the application of the method to PM_{2.5} samples collected in urban air in Xi’an which is heavily polluted during winter, demonstrating the usefulness of the method. The authors primarily examined the potential of organosulfate formation only under wintertime conditions, which likely limits the influence of biogenic VOCs on organosulfate formation. The striking result of this study is the highest concentration of glycolic acid sulfate in Xi’an, even higher than those reported in previous studies. This study suggests that glycolic acid sulfate is likely formed from anthropogenic VOCs in urban air in the presence of acidic sulfate aerosols. Overall, the study is well done with all necessary details and the manuscript is well written. The authors provide a state-of-the-art overview of the knowledge in this field. The synthesis procedure of organosulfate standards is robust and well described. The UPLC-ESI-MS/MS is also well optimized. The organosulfate synthesis and the UPLCMS method, though they are not completely new, are important and certainly adds to the quality of the field measurements. I recommend publication after minor revision.

Specific comments:

1. Organosulfate formation is very important under summer conditions, particularly due to the role of aqueous chemistry in producing sulfate which is essential for organosulfate formation. Why did the authors focus on winter conditions only?

Response: To the best of our knowledge, organosulfate related studies have been mainly associated with biogenic volatile organic compounds (VOCs), because of the large emissions of biogenic VOCs and the efficient aqueous chemistry for sulfate production in summer. Our understanding on the concentrations and formation mechanisms of organosulfates from anthropogenic VOCs is still very limited. During winter anthropogenic VOCs are very abundant in North China and aqueous-phase sulfate formation is also very efficient, particularly during haze period due to high relative hu-

C2

midity. That is the motivation for us to focus on winter conditions.

2. In Figure 3, there is an additional peak at RT of about 2.1 min in the ambient sample for glycolic acid sulfate? Please explain.

Response: In this study, we quantify organosulfates by monitoring a transition pair of precursor and product ions in the MRM mode of ESI-MS/MS analysis and by matching the retention time in UPLC analysis. When these two criteria are followed for ambient samples, the peaks can be assigned to a specific compound (i.e., organosulfate). The additional peak at RT of about 2.1 min in the ambient samples is not glycolic acid sulfate, because of different RT compared to the RT of glycolic acid standard. This peak is likely from a compound with the same transition pair of ions as glycolic acid.

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